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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
08/811,742	03/06/97	ZHANG	U/56-1641

MM31/0217
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EXAMINER HAWRANEK, S

ART UNIT 2813	PAPER NUMBER
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DATE MAILED: 02/17/99

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary

Application No.
08/811,742

Applicant(s)
Zhang et al.

Examiner
Scott J. Hawranek

Group Art Unit
2813



- ☐ Responsive to communication(s) filed on _____.
- ☐ This action is **FINAL**.
- ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.
- A shortened statutory period for response to this action is set to expire 3 month(s), or thirty days, whichever is longer, from the mailing date of this communication. Failure to respond within the period for response will cause the application to become abandoned. (35 U.S.C. § 133). Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

- Disposition of Claims**
- ☒ Claim(s) 5-12, 16, 19, and 26-48 is/are pending in the application.
- Of the above, claim(s) _____ is/are withdrawn from consideration.
- ☐ Claim(s) _____ is/are allowed.
- ☒ Claim(s) 5-12, 16, 19, and 26-48 is/are rejected.
- ☐ Claim(s) _____ is/are objected to.
- ☐ Claims _____ are subject to restriction or election requirement.

Application Papers

- ☐ See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.
- ☐ The drawing(s) filed on _____ is/are objected to by the Examiner.
- ☐ The proposed drawing correction, filed on _____ is ☐ approved ☐ disapproved.
- ☐ The specification is objected to by the Examiner.
- ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

- ☒ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).
- ☒ All ☐ Some* ☐ None of the CERTIFIED copies of the priority documents have been received.
- ☐ received in Application No. (Series Code/Serial Number) _____.
- ☐ received in this national stage application from the International Bureau (PCT Rule 17.2(a)).
- *Certified copies not received: _____.
- ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

- ☐ Notice of References Cited, PTO-892
- ☒ Information Disclosure Statement(s), PTO-1449, Paper No(s). 21
- ☐ Interview Summary, PTO-413
- ☐ Notice of Draftsperson's Patent Drawing Review, PTO-948
- ☐ Notice of Informal Patent Application, PTO-152

--- SEE OFFICE ACTION ON THE FOLLOWING PAGES ---

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DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 33, 19, 34, 35 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 33 refers to "...having a glass strain point of 593° or less..." it is unclear whether the temperature is in Fahrenheit or Celsius.

Claims 19, 34, 35 depend on claim 33, therefore are for the reasons stated above indefinite.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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Claims 5-8, 11-12, 16, 19, 27-48 rejected under 35 U.S.C. 103(a) as being unpatentable over Oka (JP '915), in view of Liu et al. (US '826) and in further view of Kuznetsov (Inst. Phys. Conf.)

Oka discloses a method of manufacturing a semiconductor device for an active matrix type electro-optical display having a driving circuit portion and display portion comprising: forming an amorphous Si layer on a glass substrate by PECVD (pg. 6, translation), selectively forming a Ni layer (pg. 14, translation) on a-Si layer in seed regions outside the regions slated to become TFT active regions, such that Ni does not diffuse into said active regions by abnormal diffusion, therefore the Ni is introduced into the seed regions by solid source diffusion. Thermally heating the Ni at 450 °C (pg. 6, translation) such that the Ni catalyst would diffuse through the semiconductor film forming crystal nuclei near the interface between the metal layer and the a-Si layer. (pg. 7, translation) After diffusion of the catalyst through the semiconductor film the metal layer is removed to prevent abnormal diffusion (i.e. diffusion into the active layer of the TFT). It should be noted, Kuznetsov teaches that a metal catalyst induced crystallization occurs by lateral diffusion of the metal throughout the a-Si. Thus, such a diffusion while not explicitly taught by Oka, is inherent in the process of Oka. Then a-Si is thermally crystallized at 550 °C, where the grain nuclei ordinarily form in the seed regions and grain growth proceeds from said seed regions parallel to the substrate surface and TFT charge carrier flow (fig. 5-8). TFTs are subsequently formed in the crystal growth region. Oka does not teach to purposely leave any areas amorphous.

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However, Liu teaches that regions of a-Si on Corning 7059 glass which were not treated with Ni prior to a low temperature thermal treatment remain amorphous, while a-Si regions which were treated with Ni crystallized into polysilicon after said thermal treatment (Example 2), and that this selective crystallization of certain regions is advantageous because it allows simultaneous formation of driver TFTs which require a low leakage current in the amorphous regions (col. 3, lines 10-17).

Therefore it would have been obvious to one of ordinary skill in the requisite art to leave second regions (disposing nickel in contact with a selected region of only the first region of the semiconductor film) of Oka amorphous by not providing a seed region in order to simultaneously form driver TFTs which require high mobility in the polysilicon regions and pixel TFTs, which require a low leakage current in the amorphous regions, as taught by Liu.

The selection of the specific concentration of Ni less than 1×10^{19} atoms/cm³ is prima facie obvious without showing that the claimed ranges achieve unexpected results relative to the prior art range (i.e. a sufficient concentration to obtain catalytic action without inducing abnormal metal diffusion, as taught by Oka) See, In re Woodruff, 16 USPQ2d 1935, 1937 (Fed. Cir. 1990). See also In re Huang, 40 USPQ2d 1685, 1688 (Fed. Cir. 1996) (claimed ranges of a result effective variable, which do not overlap the prior art ranges, are unpatentable unless they produce a new and unexpected result which is different in kind and not merely in degree from the results of the prior art). See also In re Boesch, 205 USPQ 215 (CCPA) (discovery of optimum value of result

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effective variable in known process is ordinarily within skill of art) and In re Aller, 105 USPQ 233 (CCPA 1955) (selection of optimum ranges within prior art general conditions is obvious).

3. Claims 9-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Oka in view of Liu as applied to claims 5-8, 11-12, 16, 19, 27-48 above, and further in view of Yonehara (US '093) or Shibata (US '224 or JP '224). Oka and Liu do not teach irradiating the polysilicon after the thermal crystallization.

Yonehara and Shibata teach the irradiating the polysilicon after a thermal crystallization improves the properties of the film, such as mobility.

Therefore, it would have been obvious to one of ordinary skill in the art to irradiate the polysilicon of Oka and Liu after the thermal crystallization in order to improve its mobility, as taught by Yonehara or Shibata.

4. Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over Oka in view of Liu as applied to claims 5-8, 11-12, 16, 19, 27-48 above, and further in view of Kuznetsov.

Koznetsov teaches determining Ni concentration in metal induced crystallized silicon using SIMS (sec. 2)

Therefore, it would have been obvious to one of ordinary skill in the requisite art to test the metal induced crystallized silicon of Oka or catalyst containing material of Oka by SIMS to check for the presence of and to determine the distribution of deleterious metal impurities (Oka, pgs. 10-11 of translation) as taught by Kuznetsov.

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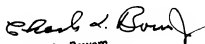
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Conclusion

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Scott J. Hawranek whose telephone number is (703) 305-0070. The examiner can normally be reached on Monday thru Friday from 8:30 to 6:00 P.M. .

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Charles Bowers, can be reached on (703) 308-2417. The fax phone number for this Group is (703) 308-7722.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-1778.


Charles Bowers
Supervisory Patent Examiner
Technology Center 2800

SJH

2/11/99